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Comment on "CAWSES November 7-8, 2004, superstorm: Complex solar and interplanetary features in the post-solar maximum phase" by B. T. Tsurutani, E. Echer, F. L. Guarnieri, and J. U. Kozyra

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(No abstract for comment)

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Recently *Tsurutani et al.* [2008] (Paper 1) analyzed the complex interplanetary structures during 7 to 8 November, 2004 to identify their properties as well as resultant geomagnetic effects and the solar origins. Besides mentioned paper by *Gopalswamy et al.* [2006] the solar and interplanetary sources of geomagnetic storm on 7-10 November, 2004 have also been discussed in details in series of papers [*Ishkov*, 2005; *Yermolaev et al.*, 2005; *Wintoft et al.*, 2005; *Chertok*, 2006; *Arkhangelskaja et al.*, 2006; *Trichtchenko et al.*, 2007; *Culhane et al.*, 2007]. Some conclusions of these works essentially differ from conclusions of the Paper 1 but have not been discussed by authors of Paper 1. In this comment we would like to discuss some of these distinctions.

Tsurutani et al. [2008] studied 3 fast interplanetary shocks (marked by FS1, FS2 and FS3) observed on 7 November before passage of magnetic cloud resulting in strong magnetic storm and indicated correspondences between these shocks and possible flares. These relations are summarized in Table 1 where 1st column shows shock number, 2nd – time of shock arrival, 3rd presents data for 2 corresponding flares for each shock – X-ray importance, time and date, active region (coordinates) on the Sun. Next 2 columns present data about flares (the same data for flares accompanied by corresponding CMEs) and CMEs (time and date occurrence in C2 coronagraph of SOHO/LASCO instrument, type

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of CME, velocity in field of view) resulting in these shocks obtained by [*Yermolaev et al.*, 2005] (Paper 2). It is important to note that in Paper 1 the sources of shocks are suggested to be flares while in Paper 2 – CMEs. Thus calculated times of flight from the Sun up to the Earth for FS1 and FS2 shocks in Paper 1 are about 1 day more than in Paper 2.

We think that the reasons of these distinctions are the following:

1. The empirical relations which have been checked up on the big experimental material [*Cane and Richardson*, 2003; *Eselevich and Eselevich*, 2004] were used for calculation of time of flight in Paper 2, and also some features of their application [*Cane et al.*, 1986a; *Sheeley et al.*, 1985a, b] were taken into account. Recent papers on the same problem [*Gopalswamy et al.*, 2007; *Kim et al.*, 2007] give similar estimations of time of flight for these shocks. Method of calculation of flight time in details is not described in Paper 1, but it is noted that velocity of a shock is considered to be constant on the Sun – Earth way. This assumption cannot be executed for FS1 and FS2 as velocity of CMEs connected with corresponding flares in two and more times exceeds the maximal velocity of plasma V_{max} behind shock fronts near the Earth.

2. As in Paper 1 the flares are supposed to be sources of shocks, authors of Paper 1 suggested that blast shock can reach an orbit of the Earth. However till now there is no any experimental proof, that blast shock can reach the Earth. At the same time practically for all CMEs in corona which move in the Earth direction and have speed more than 400 km s^{-1} in corona, the shock in an orbit of the Earth is registered [*Sheeley et al.*, 1985a, b; *Cane et al.*, 1986b; *Eselevich and Khlystova*, 2006]. Therefore it has been

naturally assumed in Paper 2 that CMEs are sources of sporadic streams of solar wind near the Earth.

Thus, conclusions of Paper 1 about sources of 3 shocks and times of their motion differ from results of early published papers and in our opinion are incorrect.

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Table 1. Solar events, resulting in fast interplanetary shocks on 7 November, 2004

Shock	Time,	*Tsurutani et al.*, 2008	*Yermolaev et al.*, 2005	
	UT	Flare	Flare	CME
FS1	01:55	C1.8 at 01:22 UT Nov. 2 AR 693 (S17E10) or C6.9 at 01:43 UT Nov. 2 AR 687 (N11W92)	M4.7 at 15:24 UT Nov. 3 (N04E37)	15:54 UT Nov. 3 partial halo CME V_k = 800 km s^{-1}
FS2	10:00	M2.8 at 01:28 UT Nov. 3 AR 691 or M1.6 at 03:32 UT Nov. 3 AR 696 (N09E45)	C6.0 at 09:00 UT Nov. 4 (N03E27)	09:54 UT Nov. 4 full halo CME V_k = 550 km s^{-1}
FS3	17:55	M2.5 at 23:00 UT Nov. 5 AR 696 (N11E19) or M5.4 at 23:09 UT Nov. 5. AR 696	M5.5 at 21:42 UT Nov. 4 (N05E18)	00:30 UT Nov. 5 full halo CME V_k = 720-1100 km s^{-1}